

RESEARCH ARTICLE.....

Soil and water quality parameters of Brackish water shrimp farms of Ratnagiri, Maharashtra

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ABSTRACT..... Study was carried out on the soil and water quality parameters of operational Brackish Water Shrimp Farms of Ratnagiri district, Maharashtra. The soil quality parameters like Texture, pH, Water holding capacity, Seepage rate and Bulk density whereas the water quality parameters are temperature, pH, DO and Suspended Solid, Alkalinity, Hardness, Ammonia, carbon dioxide and Salinity. The soil pH ranged from 7.3 to 7.6. The bulk density was 1.164 g/cm³ to 1.462 g/cm³. Water temperature ranged from 28⁰ C to 30⁰ C. The level of the Water pH ranged from 7.4 to 8.0, whereas the salinity of water ranged from 15 to 35 ppt.

KEY WORDS..... Shrimp farm, Soil quality, Water quality

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INTRODUCTION.....

Soil is the key factor in aquaculture, but much less attention is given to soil parameters as compared to water quality. Pond bottom soils are the store house for many substances that accumulate in pond ecosystems and chemical and biological processes occurring in surface layers of pond soils, influence water quality and aquacultural production (Neelam, 2003).

Availability of good quality water, in required quantities is one of the most important prerequisite for sustainable aquaculture (Ravichandran and Jayanthi, 2006). Water quality management is basically the management of water quality parameters daily to keep it in optimal conditions for growth of shrimps. In shrimp farming, management of water quality is of primary consideration and degradation of water quality is detrimental to shrimp growth and survival. Water quality

management is very important to prevent the environmental stress on shrimp that can accelerate them to various diseases (Tharavathy, 2014).

A reliable water supply is perhaps the single most important factor to be considered when selecting a site for an aquaculture venture. Water of proper quantity and quality should be available in accordance with the cycles of aquacultural operation. Therefore, when selecting an aquaculture site the water supply must be thoroughly investigated. Maintenance of water quality within the optimal levels during the culture period is very essential for ensuring good growth and survival of shrimps (Chandrakant, 2003).

RESEARCH METHODS.....

Soil and water samples were collected from the operational brackish water shrimp farms and brought to

the laboratory for analysis. Soil quality parameters were analyzed by the standard methods (Boyd, 1995). Temperature of water was recorded at the sampling station using a standard mercury thermometer. Salinity, Dissolved oxygen, alkalinity, pH, total suspended solids (TSS), Hardness, Ammonia and carbon dioxide were analyzed according to the procedures of (APHA, 1998)

RESEARCH FINDINGS AND ANALYSIS.....

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Soil quality parameters :

Soil is the most important component in a culture system. Soil quality parameters of brackish water shrimp farms of Ratnagiri are shown in Table 1.

Texture and pH :

During the present study, clayey, sandy clay and clayey loam soil types were observed in the operational brackish water shrimp farms of Ratnagiri and the soil pH ranged from 7.0 to 7.6. Muralidhar and Saraswathy (2006) have recommended that the clayey, sandy clay, sandy clay loam and clay loam are some of the textured soils suitable for aquaculture and soil pH ranging between 6.5 and 7.5 are best suited for brackish water environment.

Water holding capacity and seepage rate :

In Ratnagiri, the present study revealed that the water holding capacity ranged from 35 to 70 per cent and the seepage rate was 4 to 10 cm per day. Jayanthi (2007) has reported that the water holding capacity was less (20.7 to 36.8%) in most of the farms of the Cuddalore district, Tamil Nadu because of high sand content, where as the seepage rate was high and ranged from 10.2 to 13.1 cm/day.

Bulk density :

During the present study the bulk density was 1.164 g/cm³ to 1.462 g/cm³ in all operational Brackish Water shrimp farms of Ratnagiri. Prihutomo *et al.* (2016) reported that the bulk density is 1 to 2 g/cm³ in intensive aquaculture system of BLUPPB Karawang, Indonesia.

Water quality parameters :

Availability of good quality water in required

Table 1 : Soil quality parameters of brackish water shrimp farms of Ratnagiri

Parameters	Observations
Texture	Clayey –sandy clay-clayey loamy
pH	7.0 – 7.6
Bulk density	1.164 - 1.462 g/cm ³
Water holding capacity	35 -70 %
Seepage rate	4 -10 cm/ day

quantities is one of the most important prerequisite for sustainable aquaculture. The observation of water quality parameters of brackish water shrimp farm of Ratnagiri are shown in Table 2.

Temperature and pH :

Water temperature plays a very important role in regulating the activities of cultured animals. In Ratnagiri, the water temperature of brackish water shrimp farms ranged from 28°C to 30°C. Rahman *et al.* (2015) found the water temperature in the range of 18° to 32° C in the salinity prone areas of Bangladesh. Similar observations were recommended by Krishnani *et al.* (2006), the optimum level of temperature for most of the brackish water penaeid shrimp is 28 to 32°C.

Water with pH ranging from 7.5 to 9.0 is generally regarded as suitable for shrimp production. During the present study it was recorded the pH of the operational brackish shrimp farms of Ratnagiri ranged from 7.0 to 8.0. Rahman *et al.* (2015) found the water pH was 7.4 to 7.9 in shrimp farms in the salinity prone areas of Bangladesh.

DO and suspended solids :

During present study, DO ranged from 3.5 to 6.0 mg/lit. and suspended solids between 18 to 28 mg/lit. in the shrimp farms of Ratnagiri which are within the recommended optimum range. Rahman *et al.* (2015) found that the DO ranged from 5.6 to 6.8 mg/lit. in the salinity prone areas of Bangladesh. Gupta *et al.* (2004) stated in their study DO should be maintained in the range of 3-10 mg/lit. For penaeid shrimps, optimum concentration of DO, for maximum growth rate is 6 ppm where as optimum level of TSS for most of the shrimps is < 100 ppm.

Alkalinity and hardness :

During the study period, the values of alkalinity and

hardness were recorded and they ranged from 110 to 140 mg/lit. and ranged from 100 to 115 mg/lit., respectively. On the other hand Rahman *et al.* (2015) found that the alkalinity varied from 154.6 to 167.2 mg/lit. and the hardness content of water was found to vary from 89.01 to 117.83 mg/lit. in the shrimp farms of the salinity prone areas of Bangladesh.

Table 2 : Water quality parameters of brackish water shrimp farms of Ratnagiri

Parameters	Range
Temperature	28 to 30 ⁰ C
pH	7.0 to 8.0
D.O (mg/lit.)	3.5 to 6.0
Alkalinity (mg/lit.)	110 to 140
Hardness (mg/lit.)	100 to 115
Carbon dioxide (mg/lit.)	6.1 to 10
Salinity (ppt)	15 to 35
Ammonia	0.001 to 0.01
Suspended solids (mg/lit.)	18 to 28

Ammonia and carbon dioxide :

In present study, the values of Ammonia and Carbon dioxide content ranged from 0.001 to 0.01 mg/lit. and from 6.1 to 10 mg/lit., respectively from the Shrimp farms of Ratnagiri. Krishnani *et al.* (2006) reported that ammonia should be below 0.1 mg/lit. and concentration

of carbon dioxide below 20 mg/lit.

Salinity :

In Ratnagiri, the salinity ranged from 15 to 35 ppt. Chandrakant (2003) stated the salinity range of 10-40 ppt for brackish water shrimp farms.

Conclusion :

Soil and water quality parameters play a vital role for better production. All the shrimp farms in Ratnagiri have good water source from the creek area. In all operational Brackish Water Shrimp Farms of Ratnagiri the soil and water parameters were found to be correlated with the observations or recommendations documented by other researchers across India.

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